sustainability

MDPI

Article

Implicating Human Values for designing a Digital Government Collaborative Platform for Environmental Issues: A Value Sensitive Design Approach

Mohamed Sapraz [1,2,*] and Shengnan Han [1]

[1] Department of Computer and Systems Sciences, Stockholm University, P.O. Box 7003, SE-164 07 Kista, Sweden; shengnan@dsv.su.se
[2] Department of Computer Science & Software Engineering, NSBM Green University, Homagama 10200, Sri Lanka
* Correspondence: sapraz@dsv.su.se

Abstract: Digital technology is instrumental in designing e-government services to achieve environmental sustainability. This study aims to implicate essential human values for designing a Digital Government Collaborative Platform (DGCP), which seeks to enhance the collaboration between citizens and government officers to address environmental issues in Sri Lanka. The study adopts a value sensitive design (VSD) approach to identify human values to conceptualize the design. The results reveal 15 human values shared by citizens and officers of environmental authorities: transparency, safety, universal usability, feedback, authenticity, fairness, representativeness, accountability, legitimacy, informed consent, autonomy, awareness, human welfare, attitude, and trust. In addition to the identified human values, four system feature categories have been proposed from interviews. Thus, the study advances knowledge in designing an e-government system for collaboration between citizens and government officers, especially in tackling environmental problems in developing countries. Further, the study contributes knowledge to VSD for digital collaboration for improving environmental sustainability.

Keywords: digital government collaborative platform; environmental sustainability; value sensitive design; human values; Sri Lanka

check for updates

Citation: Sapraz, M.; Han, S. Implicating Human Values for designing a Digital Government Collaborative Platform for Environmental Issues: A Value Sensitive Design Approach. *Sustainability* **2021**, *13*, 6240. https://doi.org/10.3390/su13116240

Received: 7 May 2021
Accepted: 29 May 2021
Published: 1 June 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

The contemporary effects of rapid urbanization, economic growth, and the increasing nature of irresponsible human activities against nature, have caused severe repercussions to the environment, resulting in colossal ecological degradation [1,2]. Sri Lanka, an island located in the South Asian region, attracts many travelers due to its unique biodiversity. However, similar to global environmental issues, Sri Lanka is also severely affected by a plethora of anthropogenic challenges, including deforestation, freshwater pollution, noise pollution, air pollution, soil erosion, coastal degradation, waste management, wildlife poaching, and mangrove reduction [3]. Further, this environmental pollution has led to different health issues such as an escalating incidence of kidney diseases in the country; i.e., more than 5000 deaths occur per year due to kidney diseases [4]. The threats and degradation are increasing exponentially than ever in history and have become a part of the current discourse in the country [5,6]. Environmental Sustainability is considered the most challenging and dominant issue for the Sri Lankan government to manage at present [7].

Practical strategies and actions need to be taken by governments in addressing environmental issues. E-government services must improve the collaboration between citizens and government for addressing environmental issues. To overcome and find solutions to this new challenge, many stakeholders need to collaborate, including researchers, governments, citizens, and organizations. Nowadays, citizens can access digital tools, which

are ubiquitous and easy to use with the advancement of technology. As a result, there is an increasing tendency among citizens to engage in environmental protection activities (e.g., citizens' willingness to enhance environmental knowledge, community-led activities, citizen engagement for monitoring and engagement, and influencing decision-making and policy) [8]. This has increased the citizens' interest in green initiatives and their participation in solving environmental issues through digital platforms [9]. Thus, citizens' interest, local knowledge, and personal experience of environmental problems are crucial for detecting problems, solving, and protecting environments in their daily lives. The information and knowledge collected by the citizens should be communicated to governments through effective collaboration. However, as discussed, there is a lack of research [10,11], and minimal knowledge on how to engage citizens in environmental protection activities. More research is required to find ways to establish a community-level engagement for engaging citizens more responsible for establishing environmental Sustainability [12]. A case study conducted in Sri Lanka shows that citizens and governments are at different levels of understanding environmental problems, and no effective collaboration or communication has been established regarding the issues. The study suggested the importance of designing a 'Digital Government Collaborative Platform'(DGCP) for information interchange, building consensus, making proactive actions, and enhancing collaboration to address environmental problems [13].

A successful collaboration critically depends on the citizens' interest in adapting and using the proposed DGCP. Therefore, the DGCP must be carefully designed to implicate essential human values. The human values (the principles for guiding human behaviors) [14] must be focused on e-government Information System (IS) artifact development to improve collaboration [15]. E-government services without the focus on human values (citizen-centric) have failed to achieve their objectives [16,17]. "Organizations should concentrate directly on human values, putting individuals at the core of their work" [18]. The focus on human values is part of IS development that motivates citizens to engage in environmentally responsible behavior [19].

With this research problem of collaboration between citizens and governments to find solutions for environmental issues, the research question is formulated as follows.

What are the human values that are accountable for designing a Digital Government Collaborative Platform that increases collaborations between citizens and governments to enhance environmental Sustainability in Sri Lanka?

This study adapts value sensitive design (VSD) [20] as a system design approach, which is to shape technology with moral imagination to identify essential human values in designing the DGCP. In this approach, human values mean: "What is important to people in their lives, with a focus on ethics and morality" [20]. The pioneer of VSD, Batya Friedman and a team of researchers in a previous study emphasized the advantages of using VSD in designing digital government systems [21]. This study adopts a Value-Oriented Semi-Structured Interview to value elicitation of citizens' and receive government officers' value orientation of identified values by the citizens and government officers in designing DGCP for environmental issues.

The results reveal the 15 human values required to design a DGCP for environmental issues. The findings contribute to e-government and the VSD literature in e-government studies, especially designing a platform for citizen and government collaboration. All these identified values are derived by considering the design stage of the digital government collaborative platform, which is critical for the late design of the DGCP. Future research is needed to investigate the new values created after the implementation and use of the proposed platform. Following the introduction section, the structure of the paper includes research context and literature, VSD method, research method, results, discussion, and conclusion sections.

2. Research Context and Literature

2.1. Sustainable Development Goals (SDG) and Environmental Sustainability

Sustainable development (SD) is imperative for the survival of humans and the planet. It has become one of the widely discussed and focused aspects by almost all nations and stakeholders globally [22]. In a report published by the Bruntland Commission (formerly known as the World Commission on Environment and Development), SD is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [23]. As a measure of achieving SD, the United Nations (UN) general assembly held in 2015 introduced a UN 2030 agenda with a framework of 17 Sustainable Development Goals (SDG) and 169 targets [24]. All the member countries, including Sri Lanka, agreed on the planned agenda for a shared vision of SDG to improve people's lives and transform the world by 2030 [25].

The goal of sustainable development is to achieve long-term stability of the economy and the environment. This aim could only be acquired via proper integration and balance between economic, social, and environmental concerns in any form of development and the effectiveness of the decision-making process [26]. In terms of environmental sustainability, there are many SDGs (i.e., climate action, eco-systems, clean water, clean energy, and marine life) directed towards making the world a safer and better place for its citizens [24]. Despite all these international and local commitments, the environment continues to deteriorate. This is mainly due to policy related issues that arise from political, economic, and communication barriers [27]. E-government services are a critical enabler and pave the way to reach SDGs. Most of the SDGs are interrelated with e-government due to the open data (i.e., data connectivity and availability) [28–30]. In reaching SDGs, developing countries would have the opportunity to reach citizens in rural areas through offered digital services (i.e., disseminating knowledge, information access, and citizen participation) [30].

2.2. E-Government

E-government (or Digital government) is defined as the adaptation of Information Communication Technology (ICT) and Networks by governments to provide relevant services to citizens [31]. Government and citizens provide various forms of interactions using e-government services. Some of the commonly offered electronically mediated services by government institutions include displaying information, tasks, activities, services, businesses, transactions, and personalized service delivery [32]. The latest technological developments and innovations such as the "Internet of Things (IoT), cloud computing, big data, machine learning and artificial intelligence (AI), and the mobile Internet, etc." [33], are enablers that governments can use to provide enhanced services to citizens. In finding solutions for current dynamic and complex problems faced by government agencies, it is expected to work together with many stakeholders. ICT is an enabler and assists developing countries in numerous ways to process digital transformation (information sharing and interchange between government to government, and government to citizen) and provides enhanced services to the public [34].

According to the most recent survey conducted by the United Nation's Department of Economic and Social Affairs, Sri Lanka is positioned at 85th place. The survey categorizes Sri Lanka in the level of high EGDI (E-government Development Index), high OSI (Online Services Index), high EPI (E-Participation Index), and high OGDI (Open Government Data Index) country (very high, high, middle, and low are the levels defined under the rankings) [35]. The results show that Sri Lanka's government is dedicated to providing enhanced e-government services and citizens are willing to adapt to the systems.

2.2.1. E-Government for Environmental Sustainability

The success of the e-government services depends on the interest of the citizen in adapting the offered services. Previous studies have proved that the authorities should consider environmental sustainability as a factor that positively affects the adoption of e-government in countries as an enhancer of citizen participation [32,33]. Environmental

sustainability is a critical enabler to generate public value in developing countries [36]. E-government applications and services have been applied in various domains to improve engagement and provide a better service to citizens. Sustainability is a crucial challenge to address and overcome by governments. The government can use ICT-based solutions to preserve the environment and reduce human involvement towards environmental degradation. ICT is an enabler to increase the awareness of environmental issues and act on finding solutions, using technology to provide more environmentally friendly solutions, promoting green aspects and behavior, and increasing environmental knowledge [37]. In New York, NYC.gov is a successful government portal that provides many government services, including special attention to environmental concerns (water, air, environmental protection, and garbage recycling are key elements) [38]. The United States government manages a dedicated Environmental Protection Agency (EPA) to share information on almost all the environmental topics and discuss laws and regulations pertaining to the environment [39]. An online survey conducted in China with 630 respondents proves citizens are eager to e-participate in environmental protection activities [9]. While developing strategic goals and directives, many governments are keen on using digital technologies to control and manage environmental sustainability as a part of the sustainability agenda [40].

2.2.2. Digital Government Collaborative Platforms for E-government Services

The world has transformed almost all life events of a human into digital platforms. Citizens are inextricably interwoven with technology and better users of technology than ever in history. In academic literature, three increasing interactions are identified as information-sharing, business, civic engagement, involvement, and collaboration [41]. It is an opportunity for the government to make cost-effective and better governance. The collaborative platform is defined as an "open environment and eco-system with clear frameworks, guidelines, resources, and supports which invites all actors to collaborate in producing public value as well as a value which directly benefits the actors themselves" [42]. DGCP is an enabler to increase citizen participation and aid to decision making based on the requirements of the community in need [42].

There are two types of collaboration models, i.e., interaction-based, and content-based. The purpose of interaction-based is to increase collaboration between the interacting agents and to achieve multifaceted goals. In an interaction-based collaboration model, interactions are focused on interacting agents (e.g., within and across government agents: G2G collaboration model, government, and private/non-profit organizations: G2B collaboration model, government, and citizens: G2C collaboration model). On the other hand, the content-based collaboration model is designed based on the type of content shared (i.e., government and citizens data, processes and services, resources, knowledge, strategies, and policies) [43].

Bertot et al., [44] highlights social media use by the citizens in the government services to improve citizen participation and engagement, crowdsourced solutions, co-production, and enhanced transparency and accountability. Through social media, the government could be more transparent and accountable towards operations to build trust and increase accountability [45]. Government policymakers can utilize social media in policy formulation, feedback for proposed policies, and monitor public opinions in policy implementation. It has been proven that social media is an efficient method of increasing responsiveness and institutional learning [46].

Some collaborative e-government platforms are deployed chiefly by developed countries to engage citizens with the government [43]. However, most developed platforms collaborate towards general discussions related to urban planning. The deployed DGCPs provide a standard list of technical features such as discussion forums, ideas/opinion sharing, analytics, surveys, engagement of citizens with the government using simulation software, and design tools, reporting, and crowdfunding [41]. Interestingly, most of the solutions have been developed and implemented in the USA and provide engagement of citizens with the government for general urban issues. Though these platforms are

primarily designed for general urban issues, it can guide and provide features that could be adapted in the proposed DGCP to address environmental issues.

2.3. Human Values

2.3.1. Human Values and Environmentally Responsible Behavior

Human behavior and actions are the root cause of environmental degradation [47]. A recent empirical study conducted in Sri Lanka based on deforestation as an environmental issue provides insights into the relationship between human values and environmental issues. The study reveals that certain human behaviors and actions, political influences, and issues related to the governing structure of government officers exacerbate the controversial deforestation issue in Sri Lanka [13]. Therefore, we need to identify human values which influence and change human behavior. VBN (Value Belief Norm) theory suggests that values are pivotal and show the importance of acting with the utmost personal responsibility to reduce the negative consequences caused by irresponsible human activity's adverse effects. Citizens' direct or indirect involvement to preserve the environment is defined as 'Environmentally responsible behavior' [48]. Responsible behavior leads to subjective norms toward environmentally responsible behavior. A study has identified three value orientations: egoistic, biospheric, and social altruistic [49]. In egoistic values, people think about preserving nature to survive and believe they cannot spend a quality life without a safe environment. Humans think and act by considering the society, community, nation-state, or humanity in the whole world. Such humans with values categorize into social-altruistic. The biospheric refers to the values humans consider as protecting the environment and species as a responsibility of a human being [48,50].

Another study revealed a set of environmental related values listed as self-direction, spirituality, stimulation, hedonism, benevolence, achievement, power, conformity, tradition, security, and universalism [51]. Schwartz [51] divides the value types discussed in the above into four categories as: I. Openness to change (self-direction, stimulation, and hedonism); II. Self-enhancement (achievement, power, and some hedonistic values); III. Conservation (conformity, tradition, and security); and IV. Self-transcendence (universalism, and benevolence). The study was carried in several countries to prove his classification. Stern and Dietz's three value orientations are related to the value types of Schwartz. In the classification, egocentric orientation is related to self-enhancement, social altruistic is related to self-transcendence, and biocentric orientation is related to environmental value [52]. The Earth Charter guides as a universal declaration document related to human rights. It discusses several values for sustainability such as responsibility, knowledge, justice (free from bias), tolerance, forgiveness, freedom (equity, and fairness), purity, beauty, inner peace, integrity, dignity, equality, diversity, wisdom, nonviolence, balance (harmony), love, joy, decent standard of living, development, etc. [53]. Thus, considering incorporating human values in any solution towards environmental protection significantly affects the success of the system [47–49]. Moreover, it is a way of fostering citizens' environmentally responsible behavior and encouraging citizens' active engagement in addressing environmental issues.

2.3.2. Human Values and E-Government Design

In addition to environment-related human values, we also identified the most important human values crucial to e-government design. A study conducted to identity citizens' intentions to use e-government services towards SD in a developing South Asian country—Pakistan (moreover, a country with a similar social, political, and economic background to Sri Lanka) shows trust, attitude, subjective norm (family influence and mass media influence), and perceived behavioral control (self-efficacy, and behavioral intention) as factors [28]. Another recent exploratory study reveals three public value clusters in the e-government domain to enhance user participation. The better services (efficient, effectiveness, quality, satisfaction, etc.), better relationships (trust, mutual learning, responsiveness, accountability, transparency, individual freedom, etc.), and democratic quality (participation, empowerment, inclusion, social capital, etc.) are the three cluster participation

methods [54]. A literature review to discover public values on e-government introduce six categories of values: "improved public services, improved administrative efficiency, Open Government (OG) capabilities, improved ethical behavior and professionalism, improved trust and confidence in the government, and improved social value and well-being" [55]. By considering all these shared values (most of them overlapping) in e-government and referring to the previous IS and human values literature, the following (See Table 1) list of human values are suggested to the DGCP.

Table 1. Human values related to the proposed DGCP as an IS Solution.

Human Values	Definition (Related to E-Government Design)	Sample Literature
Universal Usability /Comprehensibility	The IS solution is available and easy to use by any of the citizens of the country willing to contribute to environmental sustainability.	"An Empirical Study of Human Web Assistants: Implications for User Support in Web Information Systems" [56] "User Interfaces for All: New Perspectives into Human–Computer Interaction" [57]
Fairness (Free from bias)	The information communicated in the platform is solely handled with the intention of making the world a safer and better place to live.	"Bias in Computer Systems" [58] "Speech interfaces from an evolutionary perspective" [59]
Accountability	Citizens and the government are responsible for providing reasons (or justification) for the request and responses in the platform.	"The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places" [60] "It's the Computer's Reasoning About Computers Fault"-as Moral Agents" [61]
Informed Consent	Citizens provide/share some sensitive information and expect to obtain permission for further processing.	"Informed Consent Online: A Conceptual Model and Design Principles" [62]
Autonomy	Ability to make an accurate judgement and to act without reacting to fake and trending news.	"Social judgments and technological innovation: adolescents understanding of property, privacy, and electronic information." [63] "Piazza: a desktop environment supporting impromptu and planned interactions." [64]
Human Welfare	Most of the citizens are eager to make green and eco-friendly environments pivotal in building quality life.	"What Online AIBO Discussion Forums Reveal about the Human–Robotic Relationship" [65], "Software Safety in Embedded Computer Systems" [66]
Trust	Citizens are expected to witness better results and active government engagement in the IS platform.	"Trust me, I'm an online vendor": towards a model of trust for e-commerce system design" [67] "Securing trust online: wisdom or oxymoron" [68]

3. Values-Sensitive Design of ICT

Information Systems (IS) research supports and endures human values in the system design process. Value Sensitive Design (VSD) is one of the theoretical approaches [69] define Value Sensitive Design as "a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process."

'What are the values is to be account in System Design?' is an important aspect to be addressed in the VSD. Values such as privacy, human welfare, free from bias, informed consent, accountability, ownership and property, calmness, universal usability, trust, identity, and environmental sustainability are expected values to be considered in technological

design [70]. VSD also concerns welfare, human well-being, human rights, human dignity, and justice. [71], in one of her initial studies of VSD, elaborates two values: user autonomy and free from bias. To promote user autonomy in design, Friedman discusses system capability, system complexity, misrepresentation of the system, and system fluidity. The value 'bias' appears in three forms: technical, preexisting, and emergent.

VSD as a methodology focuses on the main three features: 1. interactional position; 2. direct and indirect stakeholders; and 3. tripartite methodology. The VSD's interactional position describes considering both design and social context in introducing systems. Direct stakeholders directly use the system and impact from the system, while indirect stakeholders are not directly using the system but are indirectly affected by the system. In tripartite methodology, VSD is viewed as a conceptual, technical, and empirical investigation [72]. These three stages of VSD are integrative and iterative. Firstly, the conceptual analysis is carried out to discover the values relevant to the context and design, and values should be supported and diminished in the technological design process, managing value trade-off in the proposed information system (during the design, implementation, and use), and decide on priority and balance between moral and non-moral values. In the empirical investigation, empirical studies are applied to determine the fundamental values accepted and shared by stakeholders. In the last step, the technical investigation converts the findings of a conceptual and empirical investigation into a system design to embed the committed values [69].

From the VSD's inceptions to present as a design strategy, the method is widely applied to designing a plethora of domains. For example, informed consent online (web browsers, mobile applications, and open-source software's), security for mobile devices (mobile parenting technology, and implantable cardiac devices), persuasive technology (groupware, advertising, and health applications), human–robot interaction (robotic pet dogs, avatars, and humanoid social robots), computers and disabilities (public transit applications deaf-blind riders, and computer-based reading support systems), homeless young people (paper-based information services, and personal digital devices), privacy in public (cameras in public places in USA and Sweden, and online public records) are the some of the applications of VSD [20].

Still, there is no literature related to VSD based studies with a focus on addressing environmental problems. A VSD study, UrbanSim—a simulation system to model the Urban areas and environmental problems is one aspect to address in this modelling system (i.e., UrbanSim foresee next 30 years of development and their environmental impacts) [73]. With this UrbanSim, VSD played a key role in assisting public participation in using such systems in planning. Another study that adapted VSD design was related to a wastewater treatment project focused on ethical aspects pertaining to the engineering research and development project [20].

4. Research Method

4.1. Data Collection

VSD literature provides seventeen methods to empirically elicit human values [20]. Semi-structured interviews are an effective method to explicate stakeholders' values, views, and understandings. In this study, an empirical study is conducted with semi-structured interviews as a VSD to clarify values. The citizens' value statements aid in uncovering the values and system features validated by government environmental officers. However, literature related to VSD is growing with more researchers adopting the method of embedding human values in design values. For instance, some empirical studies were conducted using a semi-structured interview method for value elicitation: parent–teen relationships [74], a watcher, and watched-study about the values of privacy in a public place [75], preschool children's perception about behavioral interactions with robotic pets [76], public deliberation of urban development regarding land use and transportation [72], and children's moral standing to a personified agent [77]. Interview questions (Refer Appendix A for questions used in the study) are designed to allow stakeholders

to provide freedom to express ideas openly (questions in the form include—why, why not, how, what, your own idea, etc.). This nature of semi-structured interview questions provides in-depth information and allows stakeholders to include personal experiences and new considerations during the conversation. Data was collected through semi-structured interviews from June 2020 to October 2020. In the first phase, the citizens interested in Environmental protection engagement and activities were selected through snowball sampling. Most of the participants were introduced by the participants interviewed, and in total, 30 were selected and interviewed (See Table 2). Participants were interviewed only if they are interested in engaging in environmental protection activities through a Digital Platform. The participants were informed about the interview's purpose, and consent was obtained for the interview in order to ethically analyze and publish the information. Only five interviews were conducted in-person, and the other 25 interviews were scheduled and conducted through Digital Platforms (Zoom, Skype, Voice, and Video Calls). An average of 45 min was spent for an in-person or virtual interview. Sixteen interviews were conducted using the English language, and the other fourteen interviews were performed using 'Sinhala' language (first language used by the Sri Lankans). The interviews were conducted in the 'Sinhala' language, transcribed into the English language, and amended by an English Language expert.

Table 2. Background of the interviewees (30 citizens).

Description		Percentage
Gender	Male	56%
	Female	44%
Age	18–25	10%
	26–33	23%
	34–41	20%
	42–48	17%
	49–55	13%
	56–64	17%
Education	High School	23%
	Bachelor's Degree	50%
	Master's Degree	20%
	Doctorate	7%

In the second phase, the government officers (age range: 35 to 60 years, gender: 4 women; 6 men) (See Table 3) of the most relevant environmental related departments and authorities were contacted directly and through the contacts supplied by the officers interviewed. All the officers interviewed were high-rank officers with a minimum of 10 years of working experience, except one officer with five years of working experience. Before scheduling the interview, a list of identified values from citizens interviews with a short description of the values were forwarded to the government officers for review. Most of the respondents were interviewed within a week after they confirmed that they were ready to respond to the review of the identified values. Two of the officers were interviewed over the phone, and the rest were interviewed via Skype and Zoom. Each interview varied between 20 and 40 min (Average time—25 min). With the consent of the officers, all the interviews were recorded and transcribed for data analysis.

4.2. Data Analysis

The study carried out in this research involves an analysis of data of two groups of respondents. In the first phase, citizens' data coding and analysis are performed using three steps [78]. In the first step, the transcribed interviews are carefully analyzed, and the sentences or paragraphs are extracted if either values or suggestions for system features are reflected in the conversations (value statements). In the second step, initial data coding is performed by repeatedly reading the extracted sentences and paragraphs. The coding is

performed by following the values based on previous VSD literature and adhering to the guidelines provided in the 'Coding Manual' [79] adopted in a previous VSD based semi-structured interview qualitative data analysis. The coding manual provides guidelines to explicate, interpret, and code human values from a qualitative study. To ensure reliability, two researchers independently coded the results of a pilot interview and then discussed its discrepancies prior to the coding process. The audio recorded and subsequently transcribed interviews resulted in 679 rows of data. As a result of coding (See Tables 4 and A1) from each citizen interview, 5 to 10 values were derived through this iterative process. In total there are 15 value categories as described in Table 5 under the results section. The third step is to code the system features from value statements. The transcribed interview results revealed 4 to 9 system features, and they have been grouped in to four system feature categories. Almost all these coded system features are interwoven with the values. In the end of the coding process, the analysis shows strong inter-relationships between identified values and system features.

Table 3. Government Authorities Sample.

Department/Authority	Number of Participants
Central Environmental Authority (CEA)	2
Department of Wildlife Conservation (DWC)	1
Department of Forest Conservation (DFC)	2
Waste Management Authority, Western Province	1
National Cleaner Production Centre	1
Environmental Ministry	2
Coast Conservation Department	1

Table 4. The Coding Process of Citizen Data—An example.

Value Statements Derived from the Interview with Citizens	Identified Value	Value Category	Value Implicated in DGCP Design
"We would like to see how the concerns raised are processed. It should not be just a mere system to store concerns".	The internal process flow should be visible to the citizens.	Transparency	Provide access to internal processes feature- Citizens are provided access to login and track process flow details.
"Many ordinary people are in fear that sometimes if they raise a concern, later on, it will backfire on them". "The system should ensure that it safeguards people's personal opinions after they make the concern or complaint."	Ensure personal safety of citizens.	Safety	Protecting the privacy of the citizens' feature–The system will keep the profile information of the citizen confidentially, and it will be disclosed only when required with the permission of the citizen.

Please refer to Appendix B for the complete table of the coding process.

In the second phase, the environmental-related authorities' perceptions about the identified values are analyzed from the recorded responses of the interviews. During the interview, each of the officers responded concerning 15 listed values (as explained above, the officer received the value list with descriptions well ahead of the interview and responses were provided after a thorough evaluation), and further discussion was carried out about each of the listed values.

Table 5. The Human Values to be considered in the proposed Digital Government Collaborative Platform.

Value Category	Description	Example
Transparency (Derived from the study)	Opposite of Blackbox and related to truthfulness. All stakeholders must share accurate information.	"It will be great if we can see the actions taken by authorities to the queries submitted by the citizens through the system."
Safety (Derived from the study)	Protect the personal safety of the stakeholders	"Sometimes, when your identity is tracked, sometimes you feel that you will get certain threats. Therefore, anonymity must be there as an option. For some sensitive topics or environmental issues, people may think twice about sharing their information. Therefore, the choice must be provided-for those willing to share information, to be supplied with the relevant accessibility and for those who would prefer to interact anonymously, to be allowed that option."
Universal Usability /Comprehensibility (Derived from the study, also found in [20])	The quality of being easy or possible to understand	"Always better to allow as many people as possible to contribute to the system. Sri Lanka is a multi-cultural country, and everyone must be able to use their language and contribute through this platform." "Person like me I have many things in my head, a lot of things to care, in the meantime, if it is complex and not simple, I prefer not to use the same system again."
Feedback (Derived from the study)	Citizens prefer to receive a detailed response without being limited to an acknowledgement	"What I believe as the key here is, citizens should get feedback, and it should be provided efficiently (time is taken to respond). We need somebody dedicated to handling these queries. Moreover, when the concern is raised, the thread should be followed until we get a reasonable solution."
Authenticity (Derived from the study)	The quality of the information shared by users–level of accuracy/ credibility	"As a user, we are so confused about the information circulated on social media platforms. Some of them are manipulated and altered. It is not only fake news, but we can also find fake profiles, which are misleading and can cause unrest among people."
Fairness (Free from bias) (Derived from the study, also found in [20])	Not just acknowledging the citizens' concern, it must be legally considered, and the solution must be provided without any prejudice.	"We have experienced and generally believe that in carrying out duties, certain public officers are biased in decision making due to personal gain, or they may not be able to carry out their duties due to the influence of politicians. There is no point in such a system if such politicians influence it or if the officers do not carry out assigned job tasks according to rules and regulations."
Representativeness/Democracy (Derived from the study)	Support for a democratic society (Input of many stakeholders' views)	"There are instances where especially environmentalists' and citizens' comments, advise, and voice is disregarded sometimes in development projects carried out in the country."
Accountability (Derived from the study, also found in [20])	Citizens and government must justify their arguments-the fact of being responsible for one's actions and being able to provide satisfactory reasons for it, or the degree to which this happens.	"Before politicians come to power, they provide lots of promises, but after coming into power they pursue personal agendas. They always support their close relatives, friends, and known people. After coming into power, they never listen to the public, and so the people lose their voice and agency."
Legitimacy (Derived from the study)	The fact of being allowed by law or done according to the rules of an organization or activity.	"I would reluctantly say that how the government officers and politicians handle certain issues are not acceptable, and people have lost trust towards decision making."
Informed Consent (Derived from the study, also found in [20])	Obtain permission to use specific confidential data.	"Once we provide data/information, it must be kept safe, and only the relevant authorities must be able to access the system."

Table 5. *Cont.*

Value Category	Description	Example
Autonomy (Derived from the study, also found in [20])	The independence to make decisions without the influence of others	"We cannot always depend on the government to provide solutions; we as citizens should be able to gather through unity and contribute towards environmental preservation initiatives."
Awareness (Derived from the study)	Most citizens struggle to obtain information related to the environment and prefer to receive such information.	"We had a recent experience with noise pollution. School students preparing for an examination were struggling, and they do not know to whom they should report." "I mainly think about two things. 1. People do not know to whom they should bring issues 2. Sometimes although we raise concerns, they do not proceed to the next level."
Human Welfare (Derived from the study, also found in [20])	Citizens think about their welfare and the welfare of others.	"To live a better life and to provide our future generations a happy life, we need to preserve nature. However, with our busy work commitments, we are finding ways to contribute to environmental sustainability. This type of platform will allow us to communicate and contribute to environmental issues."
Attitude (Derived from the study)	Citizens involve in pro-environmental behavior if they are aware of the impact of their actions.	"If you can somehow change people's attitude towards environmental conservation, especially among young generations through these types of platforms, it will be a vital part of sustainability."
Trust (Derived from the study, also found in [20])	Citizens looking for active government engagement, providing better solutions, and winning the trust of the people	"This platform will become popular among people, and people will accept, and trust if this produces better results. The government endorsement and their high involvement in making things happen are crucial to this system."

5. The Results

5.1. Citizens' Values

Semi-structured interviews conducted with citizens and environmental-related government authorities revealed the 15 human values that should be accounted for in the DGCP design: transparency, safety, universal usability, feedback, authenticity, fairness, representativeness, accountability, legitimacy, informed consent, autonomy, awareness, human welfare, attitude, and trust. Table 5 provides the summary of the values with some example value statements extracted from the interviews.

In the case of transparency, it is evident that citizens prefer to see the flow of processes in the proposed platform (i.e., especially once they raise an environmental concern in the platform). As citizens interact with government officers, they feel confident if everything is managed with clear visibility (e.g., when citizens raised concerns about the key players in the process, i.e., who is the reviewer, to whom it is forwarded, and what is their stance and action). Safety refers to the citizens' expectation of safeguarding their identity and information provided or shared on the platform. Citizens doubt perhaps officers may share information with others, especially politicians who have wield the power to make life threats to the person who raised the concern. In Universal Usability, citizens believe everyone should be able to access the platform easily regardless of the language, age group, complexity, knowledge level, and digital literacy. Feedback is one of the most pivotal values of citizens. Without neglecting citizen concerns, all the concerns should be carefully managed, and responses must be provided in the earliest possible time frame. Depending on the type of concern, it may take time to provide feedback, but citizens are eager to receive a response.

Authenticity, a key challenge of any digital platform, is to manage the accuracy of information provided and communicated by the stakeholders in the platform. Citizens

expect verification and validation of information shared in the platform, and a measure to avoid fake profiles. Fairness means the citizen's expectation of justice in favor of the truth and development of the country. The general perception of the citizen is that officers are influenced by others (especially politicians) in carrying out duties, which may lead to unjustifiable and biased solutions. Representativeness indicates the citizens expectation of the platform's accessibility to as many as possible. In other words, the availability of an effective system that allows democratic participation, or freedom to express ideas concerning environmental protection. Through accountability, citizens expect responsible officers to work diligently with utmost responsibility in protecting the environment. However, citizens point out that they are not satisfied with the officers' involvement in resolving concerns raised by the citizens.

Further, citizens urge all the relevant officers in environmental authorities to follow legitimacy. They believe, at present, that in a number of occurrences without legitimate action, some manipulations to the law have been done to benefit individuals. Informed consent highlights the need to obtain citizens' permission to utilize the information provided for the purpose of lawful actions or further processing the information for other actions. Autonomy empowers the citizen to obtain required services through the platform. Awareness can facilitate the citizens to learn and obtain information that is key for them in environmentally responsible behavior. In Human Welfare, the citizens' concern is to disseminate and contribute towards environmental protection. Attitude is critical to creating a culture of 'Green movements' among citizens. Furthermore, trust is built when the DGCP produces reasonable and satisfying outcomes.

5.2. Officers' Value

The other category of primary users of the proposed DGCP is the government officers. Their opinion regarding the practical application of specified values within a real environment is key to the success of the collaboration. When the identified citizens values are presented to the officers (as explained above in the data collection), none of the officers disregarded any of the identified values. All nine officers accepted and agreed on the importance of 15 identified values with some concerns, suggestions, and a few concerns were taken into consideration in accommodating three value (out of 15) categories as explained under Table 6.

Table 6. A few concerns raised by the government officers for specific values.

Value	Officers Comments
Authenticity	"Sometimes we receive complaints from the public merely due to personal grudges. Nevertheless, we expect them to act with utmost responsibility without wasting the time of officers for useless investigations". "If the system is developed in a way to disclose personal identity, there are chances where some citizens will create fake profiles and communicate in the platform. Still, we are receiving so much anonymous information".
Feedback	"We have an issue of scarcity of resources in providing timely solutions. For certain issues, we may need some time to depend on the type of issue". "When people are given a chance to raise their voice, they may tend to make lots of queries, creating traffic. There should be a way in the proposed platform to filter the most relevant queries without spamming or creating unnecessary traffic".
Accountability	"Citizens should understand that certain development projects are carried out in the country after an Environmental Impact Assessment (EIA) conducted by an expert panel. The citizen should understand that to achieve the development of a country sometimes certain changes may need to be done to the environment." "Sometimes it is a challenge for us to listen to the policymakers or politicians elected by the people of the country and listen to the voice of the people while making sure to meet sustainability goals."

5.3. System Features

The analysis of the 15 human values derived from the study and some other value statements produced the following four categories of System features (See Table 7). The Report feature is the most important and critical feature suggested by many of the citizens. Whenever they see or experience an environmental issue, citizens prefer to contact the most relevant officer to report the issue. The proposed feature creates a platform for citizens to express their ideas to preserve nature. Interview results show there are citizens who, find a way to voluntarily participate in proposing and engaging in environmental protection activities. The Share feature enables a citizen to disseminate and create environmental awareness, among others in the country. Many believe it could create a change in attitude among citizens, leading to increased environmentally friendly behavior. Finally, the Discover feature enables citizens to retrieve and be aware of environmental authorities' services and related details, policies, procedures, and laws enforced pertaining to the environment, other environmental knowledge such as air, water, and soil related indexes, and various statistics about the environment to transform citizens into environmental knowledge citizens.

Table 7. Identified System features.

System Feature Category (with Definition)	Example	Human Values Implicated in DGCP Design
Report—Citizens can report current environmental issues perceived as a threat or harm to the environment, and it may cause negative consequences to the environment or the future generation. Reported concerns are categorized and prioritized in the order of citizens' interests.	"Honestly, there are enough and increasing environmental issues around us in the country threatening human life, biodiversity, and wildlife. We, as the public, are so eager to contribute and seek a formal way of reporting environmental issues and finding resolutions. At present, we lack a proper channel and are unable to reach out. The current practice of posting on social media has aggravated issues. Political parties and others make use of this information for personal agenda and create unrest among the people."	Transparency, Safety, Universal usability, Feedback, Authenticity, Fairness, Representativeness, Accountability, Informed Consent, Trust
Propose—Citizens propose new and innovative ideas to preserve nature. Different people including general citizens, can presentideas to experts in solving current environmental issues or solutions as future directives to build a better sustainable nation. (Similar to an idea bank)	"Each and every citizen of the country is responsible for environmental protection. Without blaming administrative officers and the government, we can take responsibility as people living in this country for years. From the day we are born, we are aware of protecting our surroundings and can, therefore, suggest better ways. What we requireis the local or provincial environmental officers' support in rolling out our plans." "I am in my sixties, and I have vast experience in working with many projects towards Environmental Sustainability. However, I feel so distraught and feel like dying when nobody uses my knowledge and my experience to make our country better."	Feedback, Representativeness, Human welfare
Share—Citizens share their day-to-day life experiences about environmental degradation and positive contributions to environmental protection (Environmental protection, knowledge dissemination and discussion). This provides the opportunity for people keen on environmental protection to have constructive dialogue.	"Why do we always promote environmental damage and negativity? Why notpromote positive vibes and create a trend that promotes pro-environmental behavior. Though it is difficult, if we change the people's attitude towards environmental preservation, it can immensely assist in changing the mindset of people."	Transparency, Safety, Authenticity, Representativeness, Awareness, Attitude

Table 7. *Cont.*

System Feature Category (with Definition)	Example	Human Values Implicated in DGCP Design
Discover—Citizens learn about environmental authorities' policies, procedures, environmental indexes, etc. This serves as a knowledge base, and this is supposed to be controlled by the relevant authorities.	"We are so eager to gain knowledge on environmental policies, procedures, and best practices. As I believe, including me, much of our environmental knowledge is so poor. If we learn about the environment, it will empower us to be effective contributors towards environmental sustainability."	Representativeness, Accountability, Legitimacy, Autonomy, Awareness, Trust

Some identified values belong to more than one System feature category.

6. Discussion

Digital technology is instrumental in designing e-government services to achieve social, economic, and environmental sustainability and SDGs. The proposed DGCP is designed with a citizen-centric approach to embedding human values discovered from citizens to create new knowledge, which is pivotal in offering an e-government service to the citizens. Findings show the most essential human values in the design of the DGCP for collaboration between citizens and government for the primary purpose of building consensus and finding solutions for environmental issues.

6.1. Research Contributions

As a theoretical contribution, the study reveals the 15 human values shared by citizens and officers of environmental authorities in designing DGCP for environmental issues. In total, eight unique human values discovered from the study (transparency, safety, feedback, authenticity, representativeness/democracy, legitimacy, awareness, and attitude) and other seven values (universal usability /comprehensibility, fairness, accountability, informed consent, autonomy, human welfare, and trust) are derived from the study as well as supported by previous literature (conceptual investigation). Moreover, interview results provide four categories of system features: report, propose, share, and discover, aligned with the identified 15 human values. The eight unique human values and other seven values are discovered within the Sri Lankan context, concerning citizens from particular social and political backgrounds interested in participating in environmental conservation through digital platforms. Most of the identified values (transparency, safety, feedback, fairness, representativeness/democracy, accountability, legitimacy, and trust) exhibit a close relationship with the political system of the country. Citizens believe, in many environmental issues, where politicians are directly, or indirectly involved in and where political pressure may influence the decision-making process of environmental officers and authorities.

Notably, most of the specified values are directly or indirectly represent the public values discussed in the above e-government literature. In the same way, values presented are closely associated with environmental values (egoistic, biospheric, and social altruistic values), earth charter values, and other environmental values presented in the research literature. During the research design, values explicated from the citizens' interviews are presented to the officers. Surprisingly, all the officers agreed with the values suggested by the citizens (with some minor considerations for a few of the values). We argue that these human values are unique to the digital collaboration in e-government research and provide an opportunity for the researchers in e-government research when designing similar digital platforms for the collaboration to handle various problems, not only environmental issues.

Although Sri Lanka is a democratic country, it has faced multifarious, severe issues. Some of the main issues among them are the corrupt administrative culture within most government institutions, threats towards national security from extremists' groups, discrimination, the trade-off between development vs. debt, and control imposed on media freedom are more challenging to resolve [80]. Hence, citizens expect the proposed DGCP to

be transparent and provide impartial, and fair justice for the environmental concerns. This is common among many developing countries with similar social and political backgrounds and human behaviors. Therefore, researchers interested in providing a similar platform as a solution in developing countries (or with similar social and political background) can consider the values directly. In contrast, others can empirically evaluate the identified human values as the findings are deeply rooted, especially in South Asian culture. With conditions, these fifteen values and four categories of system features that emerged from the empirical study provide a strong base for designing the proposed DGCP. Another contribution for the practitioners in DGCP is how to use VSD in e-government research, especially for designing DGCP for environmental problems. Its combination of the VSD method of data collections, data coding, and involvement of citizens and officers as users, help guide the designing of a similar DGCP (Figure 1). Most of the previous VSD studies are conducted in application, such as via informed consent online, security for mobile devices, persuasive technology, human–robot interaction, computers and disabilities, homeless young people, privacy in public, land use, transportation, and engineering design [20]. At present, no notable application has been developed in the domain of e-government services using the VSD [20]. The tripartite approach of VSD (conceptual, empirical, and technical) is well suited to design a DGCP as it involves many stakeholders and produces an IT artifact. van de Poel [81] discusses the notion of 'Translating values into design requirements' by using some practical examples. He has introduced values hierarchy, specification, and, for the sake of as conceptual tools to translate identified values into design requirements [81]. The knowledge created by discovering the human values and system features can be converted into design requirements using the aforesaid conceptual tools. It will provide implications for the policymakers, environmental authorities, practitioners, and VSD researchers to design an effective DGCP to promote collaboration between citizens and the government in addressing environmental issues.

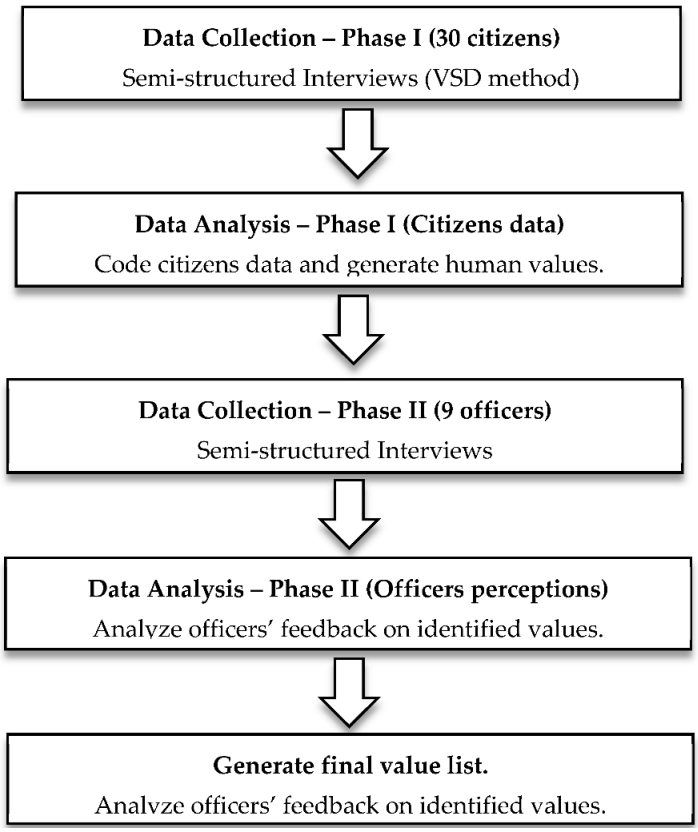


Figure 1. Research Design-Applying VSD.

6.2. Research Limitations

The study foresees some challenges (i.e., contextual, technological, and organizational factors [82]) faced by the government authorities that hinder the citizen–government and government–citizen collaborations through the proposed DGCP. In implementing this DGCP as a social–technical system, future studies should focus on the aspects of structures, legitimacy, and institutional structure of environmental authorities (at different levels) mainly based on the institutional theory [83]. Scholars have applied Institutional Theory (institutional theory mainly focuses on analyzing external conditions such as rules, regulations, relationships, norms, values, beliefs, etc., which affect organizations [84]) to analyze various aspects of e-government services and applications (i.e., institutional barriers to the digitalization of government budgeting in developing countries [85], e-government information system security [86], and dairy supply chains in India [87]).

Another challenge lies in the VSD itself as a design method. Usually, the VSD method uncovers relevant values during the design stage of introducing new technologies (as a current study reveals 15 human values in the design stage). Therefore, the method has an epistemic uncertainty (lack of information of knowing how the system behaves in the future) about the technology's values. The digital platforms have their unique form of uncertainty, ontological uncertainty. It means it is difficult to predict the users' or developers' actual use of developed digital platforms (i.e., values identified may vary depending on the practical and actual use in the future). To meet this uncertainty and value dynamism, de Reuver [88] introduced three steps: 1. practicing VSD throughout designing the digital platform; 2. adding the concept of reflexivity to the VSD (i.e., second-order learning about what values to aim at); and 3. introducing novel tools such as embed reflexivity (moral sandboxing, and moral prototyping). As a lesson learned, the traditional VSD approach must need to be modified and expanded to address the ontological uncertainties when designing DGCP in a future study. Further, VSD's features (interactional stance, identifying direct and indirect stakeholders, and tripartite methodology) and design strategy are ideal for designing e-government systems, as the success of e-government systems heavily rely on adapting the services by citizens and the response of the government officers. Moreover, environmentally responsible behavior and human values are interwoven, and VSD is useful in proposing a design solution for environmental sustainability.

7. Conclusions

The study's findings will be instrumental in designing DGCP as an e-government solution, especially for environmental sustainability, to build an effective collaboration for a developing country with a different sociopolitical and multi-cultural nature. Moreover, the study contributes to the VSD literature in designing DGCP as an e-government service. The fifteen values identified from the citizens and government officers (with their small number of concerns) and the four key system features provide a solid foundation for designing a DGCP. The values and system features are unique to the DGCP design for environmental issues in the Sri Lankan context. Results from the research contribute to the researchers interested in DGCP to design a solution from the findings to a working solution to ensure environmental sustainability. In order to further investigate this area, future research will utilize the identified human values to convert into system requirements in order to design the DGCP. The developed DGCP can be further analyzed to find the use of the system, and further improvements can be made with feedback.

Author Contributions: Conceptualization, M.S.; Methodology, M.S. and S.H; Validation, M.S. and S.H.; Formal analysis, M.S.; Investigation, M.S.; Resources M.S. and S.H.; Data curation, M.S.; Writing—original draft preparation, M.S.; Writing—review and editing, M.S. and S.H.; Visualization, M.S.; Supervision, S.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data are not publicly available due to the respondents' consent (citizens and government officials) for the current study (As the study's purpose explained to the respondents). The corresponding author may need to consult the above respondents again if necessary to use in some other studies by a different researcher.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A Interview Questions

Level 1: Demographic Information (Gender, age, and education)
Level 2: Proposed Digital Government Collaborative Platform

- What do you think about introducing a 'Digital Government Collaborative Platform' (IT-based) to communicate with the relevant government authorities in addressing environmental issues (Government endorsed)?
- If we introduce a Digital Government Collaborative Platform, as a Citizen, how can you contribute?
- What are looking for in such a platform?
- How can such a platform contribute to environmental problems?
- Do you think such platform can reduce/solve environmental issues?
- Level 3: Values
- What motivates you to involve in environmental protection activities? (Why do you think 'Environmental Protection' is essential for us?
- As per your understanding, what is important to you ('Values') in such a 'Digital Government Collaborative Platform' to address environmental issues?
- What are the Identified as obstacles or suggestions to solve environmental issues?
- What do you like/do not like in existing e-government systems?

Appendix B

Table A1. The Coding Process of the citizen data.

Values Statements Derived from the Interview with Citizens	Identified Value	Value Category	Value Implicated in DGCP Design
"We would like to see, how the concerns raised are processed. It should not be just a mere system to store the concerns."	Internal process flow should be visible to the citizens.	Transparency	*Provide access to internal processes feature*—Citizens are provided access to login and track the details of the process flow.
"Many ordinary people are in fear that sometimes if they raise a concern, later on, it will be backfired to them." "The system should ensure that it safeguards people's personal opinions after they made the concern or complaint."	Ensure the personal safety of the citizens.	Safety	*Protecting privacy of the citizens feature*—System will keep the profile information of the citizen confidentially and it will be disclosed only when required with the permission of citizen.
"It should be very user friendly and able to access in many languages. We need to think about majority as well as minority during the system design."	Ability to use the platform in many languages.	Universal Usability /Comprehensibility	*Multi-language access*—User can select the preferred language to use the system.
"Sometimes when we submit a query, we never know what happens. In this system, if we can implement to whom we are reporting, and actions taken by them is important to know."	Increase the two-way communication.	Feedback	*Track the status of the query (or similar) feature*—Citizens are always provided a feedback, regular updates, access to track the changes in addition to acknowledgement.
"We are in a digital era with overwhelming information have been shared and we are clueless to differentiate real news vs. fake news."	Accuracy and integrity of the information shared in the platform.	Authenticity	*Validate the information feature*—Information communicated (input/output) is well validated to identify the real vs. fake information.

Table A1. *Cont.*

Values Statements Derived from the Interview with Citizens	Identified Value	Value Category	Value Implicated in DGCP Design
"The government decisions should solely base on the pure intention of developing the country and not for their political advantageous and personal benefits."	Assurance of fair solutions for the citizen concerns.	Fairness (Free from bias)	*Reply and comment feature*—For the concerns raised, officers are supposed to provide a reply with evidence. Citizens can comment, like/dislike or ask for further information.
"Citizens should be empowered through this platform and this platform serves as a way to raise voice for the voiceless."	A citizen with a least digital literacy can access the system	Representativeness/ Democracy	*Simple Graphical User Interfaces (GUI) and process flow feature*—Any novice user can follow a few basic steps to interact in the system.
"We have seen the conflicts and mismatch in the ideas between politicians and officers and among government and citizens. But citizens expect a rationale for the action taken by the government."	Justification for the validity of the information shared.	Accountability	*React, comment, and reply feature*—Both citizens and officers can like, dislike, or further comment and request for the further information if they dissatisfied with the provided information.
"We have experienced and heard about the politicians and other officers influence to execute their own agenda through their political power. There is no point of systems if it is not independent from such influence."	Actions are taken according to the counties existing law, policies, and procedures.	Legitimacy	*Accessibility to the authority's policies, procedures, and legal aspects*—Users can access the internal but information where the public have right to access.
"When we report certain environmental related issues to authorities including police, perhaps they will disclose the details of the person who raised the concern."	Focus on the issue and its impact than the person who raised the concern.	Informed Consent	*Control to the personal Information sharing feature*—Users can control the visibility of their personal information in the platform.
"Without making us confuse, we are looking for detailed information for ourselves to make more accurate decisions towards problems and propose our own ideas and solutions."	Availability of information much as possible to make decisions.	Autonomy	*Making access for information feature*—Most of the information is available to access.
"Other than a few of a web sites to provide some basic environmental information, we need more interactive platforms to bi-directional communication and information retrieval."	Assistance to find required information easily.	Awareness	*Interactive information sharing feature*—Automated information request and reply ability to retrieve to find required information.
"Social work has become trending among young generation and it is easy to gather people specially for env. conservation"	Gather other citizens with similar interest.	Human Welfare	*Crowdsourcing feature*—Citizens can propose new ideas and gather others to making them to actions.
"There are some env. issues where we can find and provide simple solutions, only thing is we are not motivated enough to act."	Motivate others to engage and making them aware of simple solutions.	Attitude	*Share and propose feature*—Share what they have seen worthy for other and propose new solutions.
"Government should ensure that reported concerns are taken into the consideration as top priority and they are dedicated to find fair solutions."	Possible to provide fair solution within a short time frame.	Trust	*Reporting to different levels feature*—If the user does not receive a reply (or satisfied reply) it can be forwarded to high level officer

References

1. Han, J. Can Urban Sprawl Be the Cause of Environmental Deterioration ? Based on the Provincial Panel Data in China. *Environ. Res.* **2020**, *189*, 109954. [CrossRef] [PubMed]
2. Nathaniel, S.P.; Nuwulu, N.; Bekun, F. Natural Resource, Globalization, Urbanization, Human Capital, and Environmental Degradation in Latin American and Caribbean Countries. *Environ. Sci. Pollut. Res.* **2021**, *28*, 6207–6221. [CrossRef] [PubMed]
3. Dissanayake, D.; Tilt, C.; Xydias-Lobo, M. Sustainability Reporting by Publicly Listed Companies in Sri Lanka. *J. Clean. Prod.* **2016**, *129*, 169–182. [CrossRef]
4. Wimalawansa, S.J. Escalating Chronic Kidney Diseases of Multi-Factorial Origin in Sri Lanka: Causes, Solutions, and Recommendations. *Environ. Health Prev. Med.* **2014**, *19*, 375–394. [CrossRef] [PubMed]
5. Ranaraja, C.D.M.O.; Arachchige, U.S.P.R.; Rasenthiran, K. Environmental Pollution and Its Challenges in Sri Lanka. *Int. J. Sci. Technol. Res.* **2019**, *8*, 417–419.

6. Maheshi, D.; Steven, V.P.; Karel, V.A. Resources, Conservation and Recycling Environmental and Economic Assessment of 'Open Waste Dump' Mining in Sri Lanka. *Resour. Conserv. Recycl.* **2015**, *102*, 67–79. [CrossRef]
7. Gasimli, O.; ul Haq, I.; Gamage, S.K.N.; Shihadeh, F.; Rajapakshe, P.S.K.; Shafiq, M. Energy, Trade, Urbanization and Environmental Degradation Nexus in Sri Lanka: Bounds Testing Approach. *Energies* **2019**, *12*, 1655. [CrossRef]
8. Owen, R.P.; Parker, A.J. Citizen Science in Environmental Protection Agencies. *Citiz. Sci.* **2019**, 284–300. [CrossRef]
9. He, G.; Boas, I.; Mol, A.P.J.; Lu, Y. E-Participation for Environmental Sustainability in Transitional Urban China. *Sustain. Sci.* **2017**, *12*, 187–202. [CrossRef]
10. Hards, S. Social Practice and the Evolution of Personal Environmental Values. *Environ. Values* **2011**, *20*, 23–42. [CrossRef]
11. Hards, S. Geoforum Tales of Transformation: The Potential of a Narrative Approach to pro-Environmental Practices. *Geoforum* **2012**, *43*, 760–771. [CrossRef]
12. Seyfang, G.; Smith, A. Community Action: A Neglected Site of Innovation for Sustainable Development? In *Politics of Sustainable Development: Theory, Policy and Practice Within the European Union*; Manchester University Press: Manchester, UK, 2006; pp. 217–236.
13. Sapraz, M.; Han, S. Improving Collaboration Between Government and Citizens for Environmental Issues: Lessons Learned from a Case in Sri Lanka. In *ICT Systems and Sustainability. Advances in Intelligent Systems and Computing*; Tuba, M., Akashe, S., Joshi, A., Eds.; Springer: Singapore, 2021; Volume 1270, pp. 297–306. ISBN 978-981-15-8289-9.
14. Rokeach, M. *The Nature of Human Values*; Free Press: New York, NY, USA, 1973; ISBN 0029267501.
15. Palacin, V.; Angela, M.; Hsieh, G.; Knutas, A.; Wolff, A. Human Values and Digital Citizen Science Interactions. *Int. J. Hum. Comput. Stud.* **2021**, *149*, 102605. [CrossRef]
16. Soufi, B.; Maguire, M.; Building, H.; Way, H.; Soufi, B.; Maguire, M. Achieving Usability Within E-Government Web Sites Illustrated by a Case Study. In *Symposium on Human Interface and the Management of Information*; Springer: Berlin/Heidelberg, Germany, 2007; pp. 777–784.
17. Wang, L.; Bretschneider, S.; Gant, J. Evaluating Web-Based E-Government Services with a Citizen-Centric Approach. In Proceedings of the 38th Annual Hawaii International Conference on System Sciences, Big Island, HI, USA, 3–6 January 2005; p. 129b. [CrossRef]
18. Bell, D.; Nusir, M. Co-Design for Government Service Stakeholders. In Proceedings of the 50th Hawaii International Conference on System Sciences, Waikoloa, HI, USA, 4–7 January 2017; pp. 2539–2548. [CrossRef]
19. Winkler, T.; Spiekermann-hoff, S. Human Values as the Basis for Sustainable Information System Design. *IEEE Technol. Soc. Mag.* **2020**, *38*, 34–43. [CrossRef]
20. Friedman, B.; Hendry, D.G. *Value Sensitive Design: Shaping Technology with Moral Imagination*; Kindle Edition; Massachusetts Institute of Technology, The MIT Press: Cambridge, MA, USA; London, UK, 2019; ISBN 9780262351683.
21. Friedman, B.; Borning, A.; Davis, J.L.; Gill, B.T.; Kahn, P.H.; Kriplean, T.; Lin, P. Laying the Foundations for Public Participation and Value Advocacy: Interaction Design for a Large Scale Urban Simulation. In Proceedings of the 2008 International Conference on Digital Government Research, Montreal, QC, Canada, 18–21 May 2008; pp. 305–314. [CrossRef]
22. Sachs, J.D.; Schmidt-Traub, G.; Mazzucato, M.; Messner, D.; Nakicenovic, N.; Rockström, J. Six Transformations to Achieve the Sustainable Development Goals. *Nat. Sustain.* **2019**, *2*, 805–814. [CrossRef]
23. United Nations. *Report of the World Commission on Environment and Development*; United Nations Digital Library, United Nations, 1987; Volume 42, Available online: https://digitallibrary.un.org/record/139811?ln=en (accessed on 5 February 2021).
24. United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*; Department of Economic and Social Affairs, Sustainable Development, United Nations, 2015; Available online: https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf (accessed on 15 January 2021).
25. Athukorala, W.; Karunarathna, M. Environmental Challenges and the Sustainable Development Goals: A Study about the Emerging Environmental Issues in Sri Lanka. *Appl. Econ. Bus.* **2018**, *2*, 38–51.
26. Emas, R. The Concept of Sustainable Development: Definition and Defining Principles. *Brief GSDR* **2015**, *2015*, 1–3.
27. Howes, M.; Wortley, L.; Potts, R.; Dedekorkut-Howes, A.; Serrao-Neumann, S.; Davidson, J.; Smith, T.; Nunn, P. Environmental Sustainability: A Case of Policy Implementation Failure? *Sustainability* **2017**, *9*, 165. [CrossRef]
28. Zahid, H.; Din, B.H. Determinants of Intention to Adopt E-Government Services in Pakistan: An Imperative for Sustainable Development. *Resources* **2019**, *8*, 128. [CrossRef]
29. Rehman, K.; Shah, A.A.; Ahmed, K. E-Government Identification to Accomplish Sustainable Development Goals (UN 2030 Agenda) A Case Study of Pakistan. In Proceedings of the 2018 IEEE Global Humanitarian Technology Conference (GHTC), San Jose, CA, USA, 18–21 October 2018; pp. 1–6. [CrossRef]
30. Othman, M.H.; Razali, R.; Nasrudin, M.F. Key Factors for E-Government towards Sustainable Development Goals. *Int. J. Adv. Sci. Technol.* **2020**, *29*, 2864–2876.
31. E-Government. Available online: https://publicadministration.un.org/egovkb/en-us/about/unegovdd-framework (accessed on 5 January 2021).
32. Homburg, V. ICT, E-Government and E-Governance: Bits & Bytes for Public Administration. *Palgrave Handb. Public Adm. Manag. Eur.* **2017**, 347–361. [CrossRef]
33. Liu, S.M.; Pan, L.; Lei, Y. What Is the Role of New Generation of ICTs in Transforming Government Operation and Redefining State-Citizen Relationship in the Last Decade? In *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance, Melbourne, Australia, 3–5 April 2019*; Association for Computing Machinery: New York, NY, USA, 2019; pp. 65–75.

34. Pereira, G.V.; Cunha, M.A.; Lampoltshammer, T.J.; Parycek, P.; Testa, M.G.; Viale, G.; Cunha, M.A.; Lampoltshammer, T.J. Information Technology for Development Increasing Collaboration and Participation in Smart City Governance: A Cross-Case Analysis of Smart City Initiatives. *Inf. Technol. Dev.* **2017**, *23*, 526–553. [CrossRef]
35. United Nations. *E-Government Survey 2020: Digital Government in the Decade of Action for Sustainable Development*; Department of Economic and Social Affairs, United Nations, 2020; Available online: https://publicadministration.un.org/en/Research/UN-e-Government-Surveys (accessed on 20 January 2021).
36. Deng, H.; Karunasena, K. Evaluating the Performance of E-Government in Developing Countries. *Internet Res.* **2018**, *28*, 169–190. [CrossRef]
37. Majeed, M.T. Information and Communication Technology (ICT) and Environmental Sustainability in Developed and Developing Countries. *Pak. J. Commer. Soc. Sci.* **2018**, *12*, 758–783.
38. Stepanova, I.; Vorotnikov, A.; Doronin, N. The Potential of Digital Platforms for Sustainable Development Using the Example of the Arctic Digital Platform 2035. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *554*. [CrossRef]
39. Environmental Protection Agency. Available online: https://www.epa.gov/ (accessed on 15 January 2021).
40. Sapraz, M.; Han, S. A Review of Electronic Government for Environmental Sustainability. In Proceedings of the Pacific Asia Conference on Information Systems (PACIS), Xi'an, China, 8–12 July 2019; Available online: https://aisel.aisnet.org/pacis2019/ (accessed on 10 January 2021).
41. Falco, E.; Kleinhans, R. Digital Participatory Platforms for Co-Production in Urban Development: A Systematic Review. *Int. J. E-Plan. Res.* **2018**, *7*, 1–27. [CrossRef]
42. Millard, J. ICT-Enabled Public Sector Innovation: Trends and Prospects. In Proceedings of the ICEGOV2013; ACM: New York, NY, USA, 2013; p. 10.
43. Chun, S.A.; Luna-Reyes, L.F.; Sandoval-Almazán, R. Collaborative E-Government. *Transform. Gov. People Process Policy* **2012**, *6*, 5–12.
44. Bertot, J.C.; Jaeger, P.T.; Munson, S.; Glaisyer, T. Social Media Technology and Government Transparency. *Computer* **2010**, *43*, 53–59. [CrossRef]
45. Bertot, J.C.; Jaeger, P.T.; Grimes, J.M. Promoting Transparency and Accountability through ICTs, Social Media, and Collaborative e-Government. *Transform. Gov. People Process Policy* **2012**, *6*, 78–91. [CrossRef]
46. Ceron, A.; Negri, F. The "Social Side" of Public Policy: Monitoring Online Public Opinion and Its Mobilization During the Policy Cycle. *Policy Internet* **2016**, *8*, 131–147. [CrossRef]
47. Amel, E.; Manning, C.; Scott, B.; Koger, S. Ecosystem Conservation. *Science* **2017**, *279*, 275–279. [CrossRef] [PubMed]
48. Stern, P.C. Toward a Coherent Theory of Environmentally Significant Behavior. *J. Soc. Issues* **2000**, *56*, 407–424. [CrossRef]
49. Stern, P.; Dietz, T. The Value Basis of Environmental Psychology. *J. Soc. Issues* **1994**, *50*, 65–84. [CrossRef]
50. Stern, P.C.; Dietz, T.; Abel, T.; Guagnano, G.A.; Kalof, L. A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Hum. Ecol. Rev.* **1999**, *6*, 81–97.
51. Schwartz, S.H. Universals in the Content and Structure of Values: Theoretical Advances and Empirical Tests in 20 Countries. *Adv. Exp. Soc. Psychol.* **1992**, *25*, 1–65. [CrossRef]
52. Raudsepp, M. Values and Environmentalism. *TRAMES J. Humanit. Soc. Sci.* **2001**, *5*, 211.
53. Earth Charter International The Earth Charter. 2013. Available online: https://earthcharter.org/read-the-earth-charter/ (accessed on 30 March 2021).
54. Simonofski, A.; Chantillon, M.; Crompvoets, J.; Vanderose, B.; Snoeck, M. The Influence of Public Values on User Participation in E-Government: An Exploratory Study. In Proceedings of the 53rd Hawaiian Conference on Information Systems Sciences (HICSS), Maui, HI, USA, 8–10 January 2020; Volume 3, pp. 2103–2112. [CrossRef]
55. Twizeyimana, J.D.; Andersson, A. The Public Value of E-Government–A Literature Review. *Gov. Inf. Q.* **2019**, *36*, 167–178. [CrossRef]
56. Aberg, J.; Shahmehri, N. An Empirical Study of Human Web Assistants: Implications for User Support in Web Information Systems. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Seattle, WA, USA, 31 March–5 April 2001; pp. 404–411. [CrossRef]
57. Stephanidis, C. User Interfaces for All: New Perspectives into Human-Computer Interaction. *User Interfaces All Concepts Methods Tools* **2001**, *1*, 3–17.
58. Friedman, B. Bias in Computer Systems. *ACM Trans. Inf. Syst.* **1996**, *14*, 330–347. [CrossRef]
59. Nass, C.; Gong, L. Speech Interfaces. *Commun. ACM* **2000**, *43*, 36–43. [CrossRef]
60. Reeves, B. *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places*; Cambridge University Press, CSLI (Center for the Study of Language and Information): Stanford, CA, USA, 1996.
61. Friedman, B. "It's the Computer's Reasoning About Computers Fault"- as Moral Agents. *Comput. Sci.* **1995**, 226–227. [CrossRef]
62. Friedman, B.; Felten, E.; Millett, L.I. Informed Consent Online: A Conceptual Model and Design Principles. *Univ. Wash. Comput. Sci. Eng. Tech. Rep.* **2000**, *8*, 1–8.
63. Friedman, B. Social Judgments and Technological Innovation: Adolescents' Understanding of Property, Privacy, and Electronic Information. *Comput. Hum. Behav.* **1997**, *13*, 327–351. [CrossRef]

64. Isaacs, E.A.; Tang, J.C.; Morris, T. Piazza: A Desktop Environment Supporting Impromptu and Planned Interactions. In Proceedings of the 1996 ACM Conference on Computer Supported Cooperative Work, Boston, MA, USA, 16–20 November 1996; pp. 315–324. [CrossRef]
65. Friedman, B.; Hall, M.G.; Kahn, P.H.; Hagman, J.; Hall, M.G. Hardware Companions ?–What Online AIBO Discussion Forums Reveal about the Human-Robotic Relationship. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Fort Lauderdale, FL, USA, 5–10 April 2003; pp. 273–280. [CrossRef]
66. Levesson, N. Software Safety in Embedded Computer Systems. *Commun. ACM* **1991**, *34*, 34–46. [CrossRef]
67. Egger, F.N. "Trust Me, I'm an Online Vendor": Towards a Model of Trust for E-Commerce System Design. In Proceedings of the CHI'00 Extended Abstracts on Human Factors in Computing Systems, The Hague, The Netherlands, 1–6 April 2000.
68. Nissnebaum, H. Securing Trust Online: Wisdom or Oxymoron? *BUL Rev.* **2001**, *81*, 101–131.
69. Friedman, B.; Kahn, P.H.; Alan, B. Value Sensitive Design and Information Systems. *Handb. Inf. Comput. Ethics* **2009**, 69–101. [CrossRef]
70. Kahn, P.; Friedman, B. Human Values, Ethics, and Design. In *The Human-Computer Interaction Handbook*, 2nd ed.; CRC Press: Boca Raton, FL, USA, 2007; pp. 1241–1266.
71. Friedman, B. Value-Sensitive Design. *Interactions* **1996**, *3*, 16–23. [CrossRef]
72. Borning, A.; Friedman, B.; Davis, J.; Lin, P. Informing Public Deliberation: Value Sensitive Design of Indicators for a Large-Scale Urban Simulation. In Proceedings of the *ECSCW 2005*, Ninth European Conference on Computer-Supported Cooperative Work, Paris, France, 18–22 September 2005; pp. 449–468. [CrossRef]
73. Waddell, P.; Boring, A. A Case Study in Digital Government: Developing and Applying UrbanSim, a System for Simulating Urban Land Use, Transportation, and Environmental Impacts. *Soc. Sci. Comput. Rev.* **2004**, *22*, 37–51. [CrossRef]
74. Czeskis, A.; Dermendjieva, I.; Yapit, H.; Borning, A. Parenting from the Pocket: Value Tensions and Technical Directions for Secure and Private Parent-Teen Mobile Safety Categories and Subject Descriptors Parenting Technologies for Teens. In Proceedings of the 6th Symposium on Usable Privacy and Security, Microsoft in Redmond, Washington, DC, USA, 14–16 July 2010; pp. 1–15. [CrossRef]
75. Friedman, B.; Kahn, P.H., Jr.; Hagman, J.; Severson, R.L. The Watcher and the Watched: Social Judgments About Privacy in a Public Place. *Hum. Comput. Interact.* **2006**, *21*, 235–272. [CrossRef]
76. Kahn, P.H.; Friedman, B.; Pérez-granados, D.R.; Freier, N.G. Robotic Pets in the Lives of Preschool Children. *Interact. Stud.* **2006**, *3*, 405–436. [CrossRef]
77. Freier, N.G. Children Attribute Moral Standing to a Personified Agent. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Florence, Italy, 5–10 May 2008; pp. 343–352. [CrossRef]
78. Dadgar, M.; Joshi, K.D. The Role of Information and Communication Technology in Self-Management of Chronic Diseases: An Empirical Investigation through Value Sensitive Design. *J. Assoc. Inf. Syst.* **2018**, *19*, 86–112. [CrossRef]
79. Friedman, B.; Kahn, P.H.; Hagman, J.; Severson, R.L. Coding Manual for "The Watcher and The Watched: Social Judgments about Privacy in a Public Place". *Hum. Comput. Interact.* **2005**, *21*, 1–36.
80. Hemachandra, S.V. 'Butterflies Taking down Giants' 1: The Impact of Facebook on Regime Transformation in Sri Lanka. *South Asianist J.* **2017**, *5*, 366–390.
81. van de Poel, I. Translating Values into Design Requirements. *Philos. Eng. Reflect. Pract. Princ. Process* **2013**, 253–266. [CrossRef]
82. Falco, E.; Kleinhans, R. Beyond Technology: Identifying Local Government Challenges for Using Digital Platforms for Citizen Engagement. *Int. J. Inf. Manag.* **2018**, *40*, 17–20. [CrossRef]
83. Fuenfschilling, L.; Truffer, B. The Structuration of Socio-Technical Regimes-Conceptual Foundations from Institutional Theory. *Res. Policy* **2014**, *43*, 772–791. [CrossRef]
84. Shubham; Charan, P.; Murty, L.S. Organizational Adoption of Sustainable Manufacturing Practices in India: Integrating Institutional Theory and Corporate Environmental Responsibility. *Int. J. Sustain. Dev. World Ecol.* **2018**, *25*, 23–34. [CrossRef]
85. Effah, J.; Nuhu, H. Institutional Barriers to Digitalization of Government Budgeting in Developing Countries: A Case Study of Ghana. *Electron. J. Inf. Syst. Dev. Ctries.* **2017**, *82*, 1–17. [CrossRef]
86. Hwang, K.; Choi, M. Effects of Innovation-Supportive Culture and Organizational Citizenship Behavior on e-Government Information System Security Stemming from Mimetic Isomorphism. *Gov. Inf. Q.* **2017**, *34*, 183–198. [CrossRef]
87. Yawar, S.A.; Kauppi, K. Understanding the Adoption of Socially Responsible Supplier Development Practices Using Institutional Theory: Dairy Supply Chains in India. *J. Purch. Supply Manag.* **2018**, *24*, 164–176. [CrossRef]
88. de Reuver, M.; van Wynsberghe, A.; Janssen, M.; van de Poel, I. Digital Platforms and Responsible Innovation: Expanding Value Sensitive Design to Overcome Ontological Uncertainty. *Ethics Inf. Technol.* **2020**, *22*, 257–267. [CrossRef]